

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listing of claims in the application. Changes to the claims are shown with additions double underlined and deletions in ~~strikeout~~.

Claim 1 (Currently Amended) An apparatus, comprising:

an elongated member having a distal portion configured to engage tissue in a body and having a manipulable proximal portion, said elongated member configured to be moved in a degree of freedom;

a sensor configured to detect a position of the elongated member and output a position signal based on the position;

a controller coupled to the sensor, the controller configured to output a force signal based on the position signal; and

an actuator configured to apply a force to the elongated member, the force being applied to the elongated member as a haptic feedback based on the force signal, the haptic feedback being output when the elongated member is moved a predetermined distance.

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Claim 2 (Previously Presented) The apparatus of claim 1, wherein the degree of freedom is a translational degree of freedom.

Claim 3. (Previously Presented) The apparatus of claim 1, wherein the degree of freedom is a rotational degree of freedom.

Claim 4 (Previously Presented) The apparatus of claim 1, wherein the haptic feedback includes at least one of a detent force, a vibration, a barrier force, a damping force, and a spring force.

Claim 5 (Previously Presented) The apparatus of claim 1, wherein the haptic feedback is output when the distal portion of the elongated member has been translated to an end of a working channel that guides the elongated member.

Claim 6 (Cancelled).

Claim 7 (Previously Presented) The apparatus of claim 1, wherein the elongated member includes at least one of a guidewire, a catheter, a heart pacing lead, and a stylet.

Claim 8 (Previously Presented) The apparatus of claim 1, wherein the distal portion of the elongated member includes at least one of a blade, a serrated edge, a biopsy tool, a trocar tip, an ultrasonic tool, a needle, a vibrating tip, a suturing tool, a retractor, an electrosurgical cutter, an electrosurgical coagulator, a forceps, a needle holder, scissors, an irrigator, an aspirator, a medicator, a laser tool, a cryogenic tool, a flexible steering or guiding tip, and a camera.

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Claim 9 (Currently Amended) An apparatus, comprising:

an elongated member having a distal portion configured to engage tissue in a body and a manipulable proximal portion, said proximal portion configured to be moved in a degree of freedom;

a sensor configured to detect a first force applied to the elongated member in the degree of freedom and to output a sensor signal based on the first force;

a controller in communication with the sensor and the actuator, the controller configured to output a force signal based on the sensor signal; and

an actuator configured to apply a second force to the elongated member in the degree of freedom based on the force signal, the second force being applied when the elongated member is moved a predetermined distance.

Claim 10 (Previously Presented) The apparatus of claim 9, wherein the degree of freedom is translational.

Claim 11 (Previously Presented) The apparatus of claim 9, wherein the degree of freedom is rotational.

Claim 12 (Previously Presented) The apparatus of claim 9, wherein the controller is programmable.

Claim 13 (Previously Presented) The apparatus of claim 9, wherein a magnitude of the second force is from about 10 percent to about 90 percent of the first force detected by the sensor.

Claim 14 (Previously Presented) The apparatus of claim 13, wherein the second force is applied in a direction opposite an insertion direction of the elongated member.

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cont.
Claim 15 (Previously Presented) The apparatus of claim 9, further comprising an outer member having an orifice into which the elongated member is insertable, the actuator being disposed within the orifice.

Claim 16 (Previously Presented) The apparatus of claim 15, wherein the outer member is an endoscope and the orifice is a working channel of the endoscope.

Claim 17 (Previously Presented) The apparatus of claim 15, wherein the outer member is an introducer sheath and the elongated member is an endovascular instrument.

Claim 18 (Previously Presented) The apparatus of claim 17, wherein the endovascular instrument includes at least one of a guidewire, a catheter, a heart pacing lead, and a stylet.

Claim 19 (Previously Presented) The apparatus of claim 9, wherein the actuator is configured to apply the second force to be additive to the first force applied to the elongated member.

Claim 20 (Previously Presented) The apparatus of claim 9, wherein the actuator is configured to apply the second force to counteract the first force applied to the elongated member by the user.

Claim 21 (Previously Presented) The apparatus of claim 9, the sensor being a first sensor, the apparatus further comprising a second sensor coupled to the actuator, the second sensor configured to detect the second force.

Claim 22 (Previously Presented) The apparatus of claim 9, further comprising a position detector coupled to the elongated member, the position detector configured to detect a relative insertion position of the elongated member.

Claim 23 (Previously Presented) The apparatus of claim 9, wherein the distal portion comprises at least one of a blade, a serrated edge, a biopsy tool, a trocar tip, an ultrasonic tool, a needle, a vibrating tip, a suturing tool, a retractor, an electrosurgical cutter, an electrosurgical coagulator, a forceps, a needle holder, scissors, an irrigator, an aspirator, a medicator, a laser tool, a cryogenic tool, a flexible steering or guiding tip, and a camera.

Claim 24 (Previously Presented) The apparatus of claim 9, the sensor being a first sensor, the actuator being a first actuator, the apparatus further comprising:

a second sensor configured to detect a rotational force being applied to the elongated member; and

a second actuator configured to apply a rotational force to the elongated member.

Claim 25 (Previously Presented) The apparatus of claim 11, wherein the second force is a rotational force.

Claims 26-37 (Cancelled).

Claim 38 (Previously Presented) The apparatus of claim 1, wherein said sensor is further configured to detect a movement of the elongated member in the degree of freedom and output a movement signal based on the movement, the force being applied as a haptic feedback based on the movement signal.

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Claim 39 (New) The apparatus of claim 1, wherein the haptic feedback is applied to the elongated member before the elongated member exits a distal end of a working channel.
